ISSUE 2 / 2011

DATA – FACTS – ANALYSIS

CUTEC-News

10 YEARS CUTEC NEWS

r^3 = RESOURCES, RESOURCES, RESOURCES

Please do not misinterpret the heading as a mathematical formula, as that is not what is intended. Instead, I am highlighting the urgency of an issue which has been pushed somewhat into the background as public attention remains focused on the catastrophe in Japan and the debate on the future energy mix. The issue I am referring to is the search for a secure supply of primary materials. To produce high-tech goods, a highly technology-focused economy like Germany, which has only very limited deposits of strategic natural resources, relies on a steady incoming stream of mineral and non-mineral raw materials which have to be procured on international markets. The prices of many raw materials are increasing again as worldwide demand recovers following the recent economic crisis. Adding to the scarcity on the supply side, some producer countries are prioritizing their national interests and placing restrictions on exports (rare earth minerals being one example). In addition, some of the major deposits are located in politically unstable regions. According to an EU study last year, the situation in the worldwide commodities market is gradually becoming acute, and in the case of 14 commodities, the authors say that the supply situation has already reached the critical stage. To avoid anticipated shortages in basic commodities, the German government developed a strategy in 2010 for ensuring a secure supply of basic materials to sustain German industry and technology. The approach is similar to the government's efforts in the energy sector. The emphasis is on improved resource efficiency and increased raw material recycling. The German Resource Efficiency Programme is expected to go into effect this year. Industry will be forced to use primary resources more efficiently and to drastically reduce consumption. The goal is to double raw material productivity by 2020. In parallel with those efforts, recycling quotas will also be increased as recycling loops are closed. To translate the government's 2020 high-tech strategy into concrete action, the Federal Ministry of Education and Research launched a funding programme in November 2010 entitled "r3 – Innovative Resource Efficiency Technologies – Strategic Metals and Minerals". CUTEC is one of the organisations which are involved in this programme. Starting from its initial operational base, namely recycling and waste management, CUTEC is now strategically well positioned. Our research is focused not only on energy resource efficiency and renewable energy but also on material resource efficiency and recycling technologies. Under the leadership of the Sustainability Management Cluster, recycling projects such as detinning (tin cans), dezincing (primary steel scrap) and recycling of residue in the metallurgy industry are underway, which are aimed at closing the raw material recycling loop. Reports on these projects have already appeared in CUTEC News, and of course we will be bringing you progress reports. However, in this issue we will be taking a closer look at Thermal Process Technology. Initial trials have gotten underway on the ABSART system. We will also tell you a bit about the Stationary Flue Gas Purification Working Group which conducts research in the department under my direction. Our

Continued on page 6

“NEW FACES” – CHANGES AT THE CUTEC SCIENTIFIC ADVISORY BOARD

“What remains is change; what changes, remains.”
Michael Richter (*1952), German contemporary historian

“The only constant is change”/ “Change alone is unchanging” – this Heraclitian wordplay also applies to the membership of the CUTEC Scientific Advisory Board. There will be big changes on this board as a number of members reach the end of their term of service. CUTEC would like to express its appreciation to the long-standing contributors from the Technical University of Clausthal (TUC): Prof. Beck, who served as Chairman over a long period, Prof. Borchardt, and Prof. Scholz who has acted in different capacities since the early days of CUTEC. We also say thank you to Prof. Hapke (Technical University of Hamburg-Harburg) and Prof. Schembecker (University of Dortmund), who shared with us their wise perspective on “science beyond the borders of Clausthal”. Our thanks also go to Dr. Heumüller (H.C. Starck GmbH, Goslar), Prof. Maubach (E.ON Energie AG, Munich) and Dr. Röthele (Sympatec GmbH, Clausthal-Zellerfeld) who always provided a sense of proportion from the industrial vantage point. With great loyalty and admirable commitment to CUTEC, they have all provided valuable direction in laying out the scientific and strategic roadmap at CUTEC. With their help, CUTEC is now well positioned to function as an active, highly effective conduit between the scientific and business communities.

As we continue to pursue our successful strategy, we are pleased to extend a very warm welcome to the following new members to the Scientific Advisory Board: Dr. Buddenberg (EWE AG, Oldenburg), Dr. Gohlke (Martin GmbH für Umwelt- und Energietechnik, Munich), Prof. Grünewald (Ruhr Univeristy Bochum) and – from the TUC-community – Prof. Bohn, Prof. Schwarze and Prof. R. Weber.

Our new contributors can count on the encouragement and support from our “hard core” members: Prof. Heinzel (ZBT, Duisburg), Dr. Mayer (BMA AG, Brunswick), Dr. Wullbrandt (Nordzucker AG, Brunswick), Prof. Calmano (Technical University of Hamburg-Harburg), Prof. Horn (Technical University of Munich), Prof. Turek and our Chairman Prof. Wesling (both TUC). We know that we can rely on them to provide continuity and stability, and we would like to take this opportunity to express our gratitude to them as well.

Together we are strong. We are looking forward to working with the new board and to a creative, constructive exchange of views.

In accordance with the statutes, our Scientific Advisory Board has 15 members who are appointed by the Lower Saxony Minister of Science and Culture. Because the members are intentionally chosen from different segments of society, we and the experts who provide our funding are able to create an excellent environment for the development of new, attractive business opportunities and for intensifying our business contacts. Scientific Advisory Board meetings are held twice a year.

Starting with the next issue of CUTEC News, we will introduce you to the new board members.

(kra)

Thank you for your commitment and successful contribution


Prof. Beck


Prof. Borchardt


Prof. Scholz


Prof. Hapke


Prof. Schembecker


Dr. Heumüller


Prof. Maubach


Dr. Röthele

Welcome to the CUTEC Scientific Advisory Board


Dr. Buddenberg


Dr. Gohlke

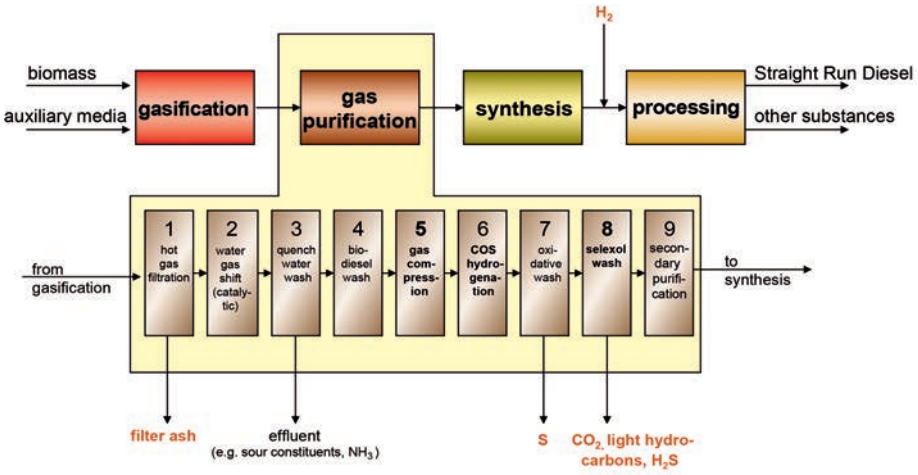

Prof. Grünewald


Prof. Bohn


Prof. Schwarze


Prof. Weber

ABSART SYSTEM TRIALS OFF TO A SUCCESSFUL START



Basic flow diagram of the syngas purification system

For the man on the street, the worldwide financial crisis had one big advantage: it put the brakes on rapidly rising energy prices. Economically motivated efforts to reduce consumption and develop alternative sources of energy began to falter somewhat, while national and EU legislators remained committed to their long-term goals. However, because the conversion of relatively cheap and readily available biomass (e.g. straw, grain processing by-products and food production waste) to electricity, heat or fuel is expensive and requires elaborate technology, interest subsided in products such as synthetic diesel (BtL) and syngas (SNG).

Work has been under way at CUTEC since 2007 on the development of economically and ecologically advanced techniques for cleaning syngas made from difficult-to-gasify biomass. The ABSART project is financed by the State of Lower Saxony (under the direction of the Environment Ministry). Funding is channelled through NBank and Biomass Conversion, a company which hopes to commercialise the technology. The total project cost is expected to be around € 1.8 million. From the innovation standpoint, what sets this project apart is the vision of minimising electricity consumption and producing useable side streams. To achieve this, the purification line is divided into multiple stages to selectively separate substances from the gas in as pure a state as possible (see illustration above). Chemically active substances and downstream regeneration are needed to remove sulphur compounds and carbon dioxide. This is done in several columns (illustration below).

System trials started in December 2010, and that was a major milestone.

The subsystems were tested using bottled syngas. The next step will be to eliminate subsystems that prove to be non-functional, and the research team will optimise and continue development work on the CUTEC biomass gas generator. The effectiveness of the analytical support systems must also be demonstrated. These systems are designed to detect sulphur compounds in the cleaned gas down into the two-digit ppb range. (vd)

ABSART columns

The first issue of CUTEC News was published as a four-page edition in April 2001. At the time, our Managing Director Prof. Carlowitz informed the readers that the intention was to "provide information several times a year about in-house developments, major environmental engineering topics, current projects and other news". Ten years on, it is safe to say that we have achieved what we set out to do. Two issues were published during each of the first two years. The frequency of our reporting was then increased to three times a year, and we also published supplements and extra issues to coincide with special events.

The size of the issues quickly increased, and news reporting now takes up 8 pages. The 15th (2005) and 20th (2010) Anniversary issues with 16 and 24 pages respectively were something special. This increase in the number of pages of course reflects the very positive development trajectory of the Institute over the past ten years. Different authors write the reports for the scientific section of the CUTEC News issues. Members of the various teams share information on the projects they are currently working on or have just completed.

A number of steps are involved as we proceed from the initial idea for a new issue to the day when you can hold a printed copy in your hands. Typesetting and layout and most of the organisation are in the expert hands of Gabriela Wessels. Editing is performed first by geophysicist Götz Jonas, then by Prof. Sven Klaus and finally (quasi as a 3rd generation operation) by the authors themselves. Every print edition in German and English is available in electronic form from our homepage. Finally, one request to our readers: do not be reluctant to tell us what you think, for example by sending an e-mail to:

cutec-news@cutec.de.

We welcome criticism and look forward to receiving your suggestions on how we could improve. Honestly! (he)

"EXHAUST GAS WG"
THE STATIONARY EXHAUST GAS CLEANING WORKING GROUP

Scientific members of the Stationary Exhaust Gas Cleaning WG: Olaf Neese, Prof. Otto Carlowitz, Torsten Reindorf, Karl-Heinz Dammeyer, Lukasz Piech, Sven Meyer (from left)

For many years, thermal and catalytic exhaust gas cleaning has been a major field of research at CUTEC. A dedicated Stationary Exhaust Gas Cleaning Working Group (currently made up of 5 research assistants and several student assistants), which organisationally belongs to "Thermal Process Technology", conducts research under the technical guidance of Prof Carlowitz. The Group was set up in 2003, and as the name indicates it concentrates mainly on non-mobile, industrial waste gas purification processes.

Tools available to the WG: pilot-scale test facilities

Besides working towards a theoretical understanding of the underlying processes, the group's work mainly involves pilot-scale experimental trials.

The WG has access, for example, to a thermal recuperative oxidiser designed for 1,200 m_N^3/h waste airflow. A high-versatility control system and the facility to inject a number of different contaminants enable the researchers to conduct investigations covering a broad range of parameters (temperature, volume flow and concentration). The pilot-scale system is suitable for investigating phenomena such as the oxidation characteristics of different exhaust gas constituents (conversion, NO_X formation, etc.) under specific operating conditions or to test new burner designs (modulation, stability, combustion, contaminant formation).

A three-tower RTO (Regenerative Thermal Oxidation) designed for 3,000 m_N^3/h waste airflow is also available at the pilot test centre. Investigations on the formation and reduction of NO_X and the development of a control system for the hot bypass in super-adiabatic mode are being carried out on the RTO.

A central dosing station is available for investigations on the oxidation characteristics of particular exhaust gas constituents (solvents in particular) and mixtures. As the station is configured as three parallel dosing lines, three different substances can be added to the exhaust air simultaneously. The dosing station is normally set up to feed substances to the RTO system, but it can easily be reconfigured for use with the TO (Thermal Oxidation) system or other systems at the test centre. With the aid of an SNCR (selective non-catalytic reduction) system, lances can be used to inject a liquid reduction agent into the exhaust gas purification process in order to lower the NOX level through reduction.

TO pilot system at the test centre

Process development and optimisation

Besides research projects on existing exhaust gas cleaning systems, the group also carries out projects to develop new techniques or improve / optimise existing techniques. The ideas for these projects are derived directly from practical application, e. g. from users and equipment manufacturers or from what the group has learned in generating technical assessment reports. In collaboration with systems manufacturer LTB GmbH & Co. KG and the user ALBIS PLASTIC and with the financial support of the German Environment Foundation (DBU), the group has developed a variant RTO process which can remove deposit-forming constituents from exhaust gas. Full-scale versions for various practical applications are currently being designed, and plans are in place to build them.

On the "Automotive Paint Shop Exhaust Gas Purification" project, the group worked with Volkswagen to optimise 23 TOs which clean exhaust air from paint dryers at the company's Wolfsburg site. The combustion temperatures in the TOs were lowered, and downstream oxidation catalysts were installed. The concept was implemented step-by-step with ongoing scientific support. The initial estimate of roughly 25% optimisation potential was actually exceeded on some lines, and a reduction in fuel consumption of up to 40% was achieved in some cases.

In addition, the following activities

- emissions and acceptance measurements
- modelling and simulation
- statistical analysis of operational data
- consultancy, appraisals and
- contribution to the generation of VDI guidelines

are also part of the Stationary Exhaust Gas Cleaning Working Group's range of activities. (da)

BIOPROCESS DIVISION

Divisional profile and current projects

The Bioprocess Division, which was formed nearly 5 years ago, has long become an integral part of the CUTEC core operational activities. It acts as the interface between the scientific and engineering communities in the field of biotechnology As a result, its research projects tend to be broadly based and typically involve interdisciplinary collaboration with the operational departments at CUTEC and/or in partnerships with external industrial partners or other research organisations. Two new professional staff joined this division in January 2011 (see page 8).

In collaboration with engineers from the Physical and Biological Process Technology Department, the Bioprocess Division is currently working on several projects to improve the efficiency of regenerative resources and energy generation processes.. We hereby report on two projects to improve the efficiency of biogas plants as follows:

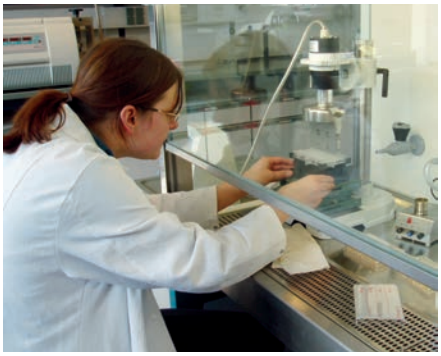
An FNR (Renewable Resources Agency) project on the production of biomethane from energy beets is underway to determine whether it is in principle possible to produce unsubsidised biogas at prices which can compete with natural gas (see CUTEC News September 2010). Breeding experts (KWS AG, Einbeck), researchers (DBFZ, Leipzig) and an equipment manufacturer (INPUT GmbH, Sehnde) are members of the consortium. Initially, the role of CUTEC is to select genotypes from ongoing beet production which offer the greatest potential for biogas production. The best “candidates” are then put through continuous 5-litre scale fermentation. 16 bioreactors which operate continuously have been built during the course of the project (see illustration above). The reactors are equipped with automatic feed mechanisms, instrumentation and central process control which enable the team to determine the optimal reaction kinetics parameters. The results are then verified during 1000L pilot-scale trials. Modelling of the biological methane formation process is carried out to supplement the practical trials.

Automated biogas reactors (left) with continuous data acquisition (right)

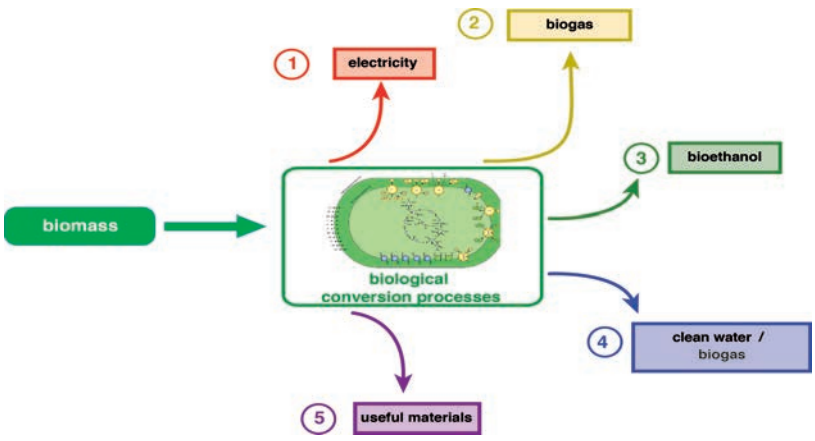
The ZIM project on thermal-enzymatic hydrolysis to boost productivity at biogas plants is being carried out in collaboration with an industrial partner, INPUT Ingenieure GmbH. The goal is to develop a process for digesting ligneous fermentation residue and subsequently returning it to the fermentation process. Commercial enzyme systems were evaluated during preliminary trials and optimised based on their throughput performance (see CUTEC News Sept. 2010).

Trials are currently underway on treatment (breakdown/conversion) of the fermentation residue using selected organisms (e. g. fungi) and enzyme systems that have been isolated from them. The illustration at the right shows the preparation of enzymes using an ultrasonic digester (developed in house) for micro titre plates. Following preparation, a photo-optical system is used to determine activity levels. Although isolated enzymes often deliver higher performance, it takes a lot of effort to produce, immobilise and inject them. Living organisms on the other hand are able to reproduce, and that plays a crucial role in the overall economic performance of the process. If the results are positive, the plan is to design a demonstration system.

In the future, the group will be looking for ways to improve dynamic process control systems for biogas plants. A process will be developed for these model-based systems to periodically calibrate the models with the actual process, so that in the future temporary model-process deviation will not lead to misinterpretation. The group also plans to expand the utilisation of biomass as raw material. The planned project application will emphasise synergies with biomass utilisation to generate energy. Work from an earlier project on the use of a microbiological fuel cell in effluent applications will be continued. The group wants to achieve a better understanding of the composition of microorganisms and new hydrogen-selective membrane materials. (schl)



Ultrasonic digestion of microorganisms for enzyme preparation



A number of regenerative materials and energy sources can be produced from biomass with the aid of biological conversion processes

Expert talk at the CUTEC stand

CUTEC AT GREEN WEEK 2011 IN BERLIN – A REVIEW

Green Week (Grüne Woche) is the world's largest agricultural, food and horticulture show, taking visitors on a culinary round-the-world trip through 50 countries in 26 buildings. Does it really make sense to share information on Fischer-Tropsch synthesis for the production of 2nd-generation biofuel at an event like this?

CUTEC took up the challenge of catering to the needs of a diverse visitor mix: biros for the "hunter-gatherers", handy brochures for people in a hurry, a light-hearted live performance, fresh popcorn, a children's quiz, a coordinated series of posters and exhibit items for people interested in the technical aspects.

We were well prepared for the show, and the results exceeded our most optimistic expectations. One major reason for that was the decision by the organiser to locate all of the exhibitors, who are working in the field of renewables in a variety of different ways, near each other at the show. At a safe distance from the food and beverage stands in other buildings, visitors with expertise levels ranging from recently aroused curiosity to insider knowledge came to learn more about the technical aspects.

The theme at the CUTEC stand and the other stands close by was the use of renewables to generate power, which at an event which focuses on food and nutrition would normally be viewed as a competing use of arable land. However, the technique presented by CUTEC to produce fuel from biomass residuals such as straw avoids the "table or tank" problem. Visitors who wanted to learn more about the differences between biological and thermal pathways to biofuel production made their way to the CUTEC stand.

The international character of the show was reflected in the nationalities of the visitors and the discussions on the potential of biomass. Particular attention was drawn to the significance of the BtL process which, although requiring high up-front investment, can make a big contribution by converting biomass residuals into fuel and basic chemicals. There is no lack of suitable locations. Still, prior to making the final investment decision, users should run trials at a demonstration plant to verify that there is a good match between the process and the raw material.

Sources of funding were also a topic of intensive debate. On camera – directly visible at the opposite stand – dissatisfaction was expressed with the lower level of funding available for biomethane, which can be readily stored, compared to generation from fluctuating solar and wind sources.

Fresh popcorn was available at the CUTEC stand to attract attention even at times when visitor numbers were slack. The aroma spread over a wide area, bringing people to the stand who, depending on age, either actually had the opportunity to enjoy the treat or were "fed" with information instead. That at any rate was the "official rule". In actual fact, a lively trade developed with neighbouring stands, which more than compensated for the major drawback of the CUTEC stand (no running water, no coffeemaker = no fresh coffee) and resulted in many interesting discussions.

All in all, many visitors will (undoubtedly) have fond memories of the CUTEC stand because of the popcorn and some (hopefully) because of the stimulating discussions. (be)

IMPPRINT

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Continuation from page 1

r^3 = RESOURCES, RESOURCES, RESOURCES

Chemical Analysis team, which is a contributor to the ABSART project, has succeeded in drastically lowering the detection threshold for sulphur compounds in raw syngas produced through gasification of biomass. You can read the report on Page 7. As always, I wish you an informative reading experience. Incidentally, there is no harm is using CUTEC News as a resource to stimulate your mental activities.

Yours sincerely,

Otto Carlowitz

P.S.: As you are undoubtedly aware, I marked my 60th birthday some time ago. As I would like to ensure a seamless transition when a new Managing Director takes over at CUTEC, a schedule has been drawn up in collaboration with the CUTEC Supervisory Board and the relevant organisations at TU Clausthal to ensure timely succession planning. In February, a vacancy for a W3 Professorship in Environmental and Energy Technology was advertised in various media. The person filling the vacancy will be given a release, so that he or she will be able to act as Managing Director at the CUTEC Institute.

Sample container connection

NO ROTTEN EGGS HERE – TRACE ANALYSIS OF SULPHUR COMPOUNDS

Volatile, gaseous sulphur compounds such as hydrogen sulphide (H_2S), thiols (R-S-H) and thioethers (R-S-R) are generally toxic compounds with an intense odour. They are formed, for example, during decomposition of sulphurous organic matter. H2S is responsible for the unpleasant odour of rotten eggs. Small amounts of tetrahydrothiophene are added to natural gas to provide warning of gas leaks, because even trace amounts emit an odour which humans can detect.

Sulphur compounds are not harmful to humans. They do however “poison” catalysts, rendering them useless. Sulphur content at oil refineries must be determined very precisely based on concentration and number of constituents. A gas chromatograph (GC) with a special PFPD detector (pulsed flame photometric detector) is often used for this purpose. CUTEC is conducting intensive biogas research on a number of projects, and this gas also contains sulphur compounds. The Institute has a GC with PFPD. A new sample injection system has been installed on the GC to ensure reliable analysis of low and high concentrations.

Sulphur analysis is currently needed on two projects to verify sulphur removal from process gas. The Chemical Process Technology Department is developing a fuel cell system for generating electricity from biogas. The sulphur content, almost exclusively H2S, is reduced from 20 – 100 ppm to less than 1ppm. H_2S content is monitored constantly, as the sulphur trap has to be changed at different intervals depending on the load factor. The GC is used to verify online detection and to check for the presence of other sulphur constituents.

The Thermal Process Department produces syngas from a variety of biomass sources. The gas will then be converted to fuel (BtL) using the Fischer-Tropsch process. The catalysis are very susceptible to sulphur. The ABSART project is developing a continuous, multi-stage desulphurisation process which is designed specifically for H_2S and COS (carbonyl sulphide). The GC documents the concentrations in the incoming raw gas (several hundred ppm) and the different purification grades. Practically no sulphur should be left in the cleaned gas.

The GC was originally designed for online detection from a gas stream. That is not feasible due to the large number of sampling points, and external samples are also taken. In addition to their other unpleasant properties, the sulphur compounds adhere to metals, resulting in losses on interior surfaces. To address the problem, special sample containers were procured which have a coating on the inside to which the sulphur compounds do not adhere. Used sample containers are rinsed with neutral gas, baked out and then checked for cleanliness.

Due to the different types of samples, the problem is to detect content levels over several orders of magnitude using optimised techniques, and there are problems to resolve at both ends of the scale. High concentrations cause detector overload and can lead to long-term contamination. Low concentrations are difficult to determine and can produce false results when the sample is taken.

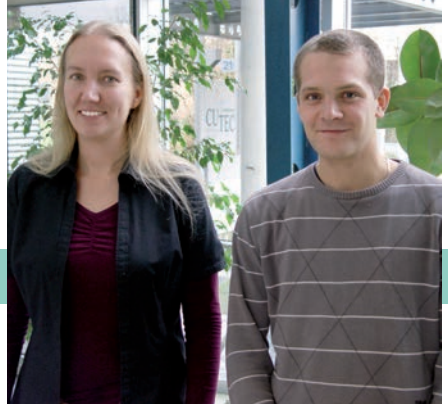
The new sample introduction system on the GC is made of coated parts and has fittings for sampling cylinders, gas sampling bags and test gas bottles. Its small volume is sufficient to analyse small amounts of gas, and it can be quickly cleaned. The pressure in the system determines the sample size for the analysis. At low input pressure, the sample mass as it enters the GC is already reduced to the point where samples with high sulphur content can be analysed. This avoids the effort and potential error factor involved in diluting the sample with a neutral gas prior to injection.

With the injection system, a defined volume of test gas can be added to the sample as an internal standard to increase the reliability of the results on samples with low sulphur content.

With methods developed by the Department, calibration was performed using a number of different sulphur components which might possibly be contained in the samples. Calibration can be performed over a wide range of concentrations.

The development activity is also the topic of thesis work which is currently in progress. The GC is now capable of analysing samples in the two-digit ppb range, and the technique will also be available for other partnership projects. (do)

Results analysis



Anne Dittmar and Hannes Beese provide support to the Sustainability Management Cluster

NEW ADDITIONS TO THE TEAM

Four new employees have strengthened the teams to provide support for the Institute's wide-ranging project activities.
Anne Dittmar has a degree in Materials Science from TU Clausthal. The title of her thesis was "Direct Observation of Stress Corrosion and Subcritical Crack Propagation in Silica Glass". She subsequently worked as a research assistant in the TU Clausthal Non-Metallic Materials Department until 2010. While there, she was involved in DFG and BMBF research projects in the Glass Department for three years and then moved over to the Engineering Ceramics Department.

At CUTEC, she will be contributing to successful project outcomes in the Sustainability Management Cluster. Her main responsibilities will include the development, construction and test of a pilot system for processing residue from the metallurgical industry within the framework of a BMBF project.

Hannes Beese started working at CUTEC as a technician in the Sustainability Management Cluster on October 1st.

Hannes completed his vocational training as an industrial mechanic at Purmo DiaNorm Wärme AG in Vienenburg and stayed on to join the company's workforce. In 2008, he enrolled in a technician course at the Technical College in Braunschweig and received his diploma the following year. Hannes will be helping to build and operate the pilot system for processing residue from the metallurgical industry.

Since it was set up five years ago, the Bioprocess Division has made a valuable contribution to CUTEC's research activities. To help the group deliver the same level of excellent performance in the future as the project workload continues to increase, Stefan Hartwich and Isabella Legzdins joined the group on January 2nd, 2011.

Stefan received a degree in Environmental Technology / Biotechnology from Mittweida University of Applied Sciences. Following graduation, he was a Research Assistant at Neubrandenburg University of Applied Sciences in the Food Science Department, where he worked on the development of a biosensor platform for food analysis.

Stefan will be supporting bioenergy research at CUTEC. He is currently involved in projects which are exploring ways to improve the efficiency of biogas processes.

Isabella Legzdins is no stranger to CUTEC. She began training as a chemical lab assistant at CUTEC in September 2006 and successfully completed the vocational training course in 2010. She subsequently worked in the Tribology and Energy Conversion Department at TU Clausthal before returning to CUTEC in January 2011. She will provide bioanalysis support to the Division and look after the test systems.

(wes)

Isabella Legzdins and Stefan Hartwich recently joined the Bioprocess Division

Fun on the ball: The CUTEC football team

For the past three years, CUTEC has fielded a football team which competes in a number of tournaments in the region. The players have every reason to be proud of their performances on the pitch. Ten teams took part in the Altenau tournament in 2009, and our players finished second. The following year, the team of football enthusiasts from CUTEC won the tournament in Petershütte, outperforming the five other teams. This year, twelve teams competed for the honours in an indoor tournament organised by Klosterhof GmbH. After winning their group, the CUTEC Team lost to the eventual winners FC Zellerfeld on penalties. The players quickly overcame the disappointment, defeating the TUS Betreuer team 2:0 in the battle for third place. The next matches have already been scheduled. TUS Clausthal has invited CUTEC to take part in a tournament for recreational teams on June 25th. (ba)

Reward for hard work: trophy and certificate for the "CUTEC team"